Life and Living

TEACHER'S NOTES

FOR BOOKS 1, 2 & 3

B. H. G. CHAPLIN

LONGMANS

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by

B. H. G. CHAPLIN

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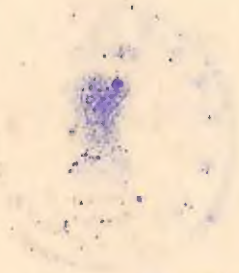

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GENERAL NOTES

You should find teaching this Course much less of a problem than other ways of taking Nature Study lessons BECAUSE:

YOU DO NOT NEED ANY SPECIAL SCIENTIFIC KNOWLEDGE.

It is quite possible for you to teach what is in this book straight away, without referring to other books. You will soon feel, however, that you want to know more about the things in this book. To help you, we have provided a list of suitable books at the end of each Pupils' Book.

THE PRICE OF THIS SIMPLICITY IS SOME OF YOUR 'OUT OF LESSON' TIME EACH WEEK

(You will, however, find it much more enjoyable than the normal 'Preparation of teaching notes'.)

You are required to do beforehand EXACTLY what the books require the children to do. This MUST be done using your own hands and eyes. When the children are asked to draw or write, you must do the same. This is the whole of your preparation. It is preparation that you cannot do without.

THIS IS THE 'ONLY' WAY TO TEACH THIS COURSE.

Let me now try and explain the ideas behind this new and simple approach.

The object of this kind of teaching is NOT to help the children to REMEMBER a lot of INFORMATION

The object is to LEAD them to observe accurately some of the living and non-living things around us, and to UNDERSTAND the way they work. (What really goes on inside them, how clouds are formed, why iron ships float, and so on.)

Years of research into the way our children think about these things gave us two important facts:

1. Young children can understand SOME scientific facts quite well IF the ideas are divided into SIMPLE STEPS, and each step is reached by the child DOING something with his hands, or SEEING something with his eyes.

2. We found that home background and ideas had very little effect on a young child's ability to learn understandingly by doing and seeing.

(A comparison test between Ghanaian and American children at 9 years of age showed no difference either in their ability to understand or in the kind of thinking they did about these things.

We did find that *after further years of schooling* the fact that a great deal of the learning in our schools is only book-learning for examinations causes our children to fall far behind children at American or European schools.)

Because of these facts the Course has been put together as follows:

A. Out of all the desirable information in present syllabuses, only those parts in which understanding can be taught in a number of practical steps have been chosen for you to work on.

The practical way takes much longer, so that the Course is not so full. But . . .

IT IS MUCH MORE IMPORTANT THAT THE CHILDREN UNDERSTAND FULLY A FEW EXAMPLES OF THE WAY NATURE WORKS, THAN THAT THEY REMEMBER HUNDREDS OF STATEMENTS AND DIAGRAMS

B. The Course teaches each lesson *in simple steps*. Each step is a fact that the child will realise for himself by DOING something with his hands, or SEEING with his eyes.

All the steps together lead him to understand the idea that the lesson sets out to teach.

C. The Course is so arranged that the teacher becomes a *leader*

and an *organiser* in an exploration that he and the children undertake *together*.

BUT the teacher must explore first for himself, before he attempts to lead the children along the same path.

YOU YOURSELF MUST DO THE WHOLE OF THEIR WORK FOR THE LESSON BEFOREHAND. To have done this gives you your *only necessary qualification* for teaching any part of this Course. This preparation is absolutely essential.

THIS IS THE ONLY WAY TO TEACH THIS COURSE.

You will find that:

It will take some of your own time.

It will be most revealing, especially if two of you try out these things together.

You can approach the lesson and the children with complete confidence.

You will enjoy leading the children to find out what you have enjoyed finding out for yourself.

SYLLABUS OF THE COURSE

The books are not divided into 'lessons'. One page may well occupy two or three teaching periods. That is left to you.

The work is, however, grouped. Two or three pages at a time deal with the same topic. Each topic is a main heading in the contents to each book. You may find it more convenient to do them in a very different order, depending on the season of the year, and the material for lessons which you can get at the time.

Each topic group is complete in itself. You cannot just take some pages from it. You must do each part of a topic in the right order, and finish it completely before going on to anything else.

Plan the order of your groups at the beginning of the term or even year, but be prepared to change the order if there is good reason for it.

PRACTICAL WORK

TRY EVERY EXPERIMENT YOURSELF FIRST BEFORE THE LESSON.

Look at the work in the book two or three weeks in advance. The children often have to bring or collect things, and sometimes it is necessary to start growing things for experiments as much as three weeks ahead.

The biggest problem at first will be getting the children to bring the materials you want in sufficient number and at the right time. It will pay you to try hard at this at the beginning. To help you to choose what has to be done early, you will find that whatever needs your special attention beforehand is printed in *light lettering* in the text of the books.

DRAWINGS

Even a crude and unskilled drawing, made by a pupil from his own observation, is a hundred times more valuable than a careful copy of a blackboard sketch or a diagram from a text book. With your help, he will improve in time, but *never* allow him to copy.

Where it is difficult for children to express themselves in a second language, drawings offer an easier way for them to record facts. Such simple drawings are often more valuable than words.

When you do each experiment for yourself before the lesson, record what you have done in simple drawings. This will help you to encourage the children to do the same.

WRITTEN WORK

Sometimes these books ask for written answers to questions. Where possible these questions are worded so as to give most of the words and the construction of the sentence needed for the answer. Get the children to see this.

Where children have to be helped more definitely to write in English, you can write part of each of the sentences on the blackboard, leaving out the words that give the answer.

EXAMPLES

'Do plants take in air and water? If they do, how do they do it?'

1. Plants . . . take in air and water. (Do or Do not, is left for the children to write in themselves.)

2. Plants take in air through their . . . . . They take in water through their. . . . . (Leaves and Roots are left for the children to put in.)

Never allow complete copying from the board. When the language situation is sufficiently improved, even this limited copying should be done away with altogether.

APPARATUS

Jam jars are very frequently used in this practical work, though we have found that in some areas they are not available. In Book III there is given a method of cutting off the tops of beer bottles to serve the same purpose.

All the other material can be found in any village, and only apparatus that has been made successfully by nine-year-old children has been included.

GENERAL

You will realise that this Course tries to train the child in observation, and to give him a real understanding of the subject through HIS OWN practical work. Although, as in all subjects, correcting and testing by you is necessary, your MAIN task will be to ENSURE THAT PROPER PREPARATIONS HAVE BEEN MADE, TO ORGANISE AND TO GIVE GUIDANCE AND ENCOURAGEMENT.

BOOK ONE

THE 'CUT-IN-HALF' PICTURE, *page 3*

The first page needs no comment beyond the fact that any fruits or objects that can be cut in half may be used by you to illustrate the point. Remember that the drawings must be the children's own efforts.

GETTING READY TO LOOK AT LIVING THINGS, *pages 4-9*

Page 4. The ruling out of the notebooks will take one full-hour period. To make a good start to this exercise, it would be a good idea to set the task of collecting observations of living things to write about during the week in spare time, and to complete the writing up of the observations in the next Natural Science period under your supervision. Discussion of what individual pupils have written down will provide material for this next lesson, and will stimulate further efforts.

Their first attempts may be poor, but it is essential that you persist. For those who have neither collected nor observed anything during the previous week, you may have to do something more. Take them out of the classroom. Let them observe some insect, bird or plant during the period. Take them back to the classroom and help them to write it up.

One important thing to remember is that, although the NATURE DIARY is not mentioned on every page of these books, it is intended to be kept up ALL THE TIME.

Page 5. The Nature Tables can be made from sides of boxes. The details are left to you. You may be fortunate in having a table to spare for this. Whatever form it may take, a Nature Table is absolutely essential. Never leave things for more than two weeks on it,

or let it get untidy, dusty or disused. Let groups of children take turns in being responsible for it. It is most important to label exhibits; help the children to do this. This is also a suitable place for the class Weather Chart.

Page 7. For your killing bottle, petrol can be used, but be careful never to have it near a light or fire.

Page 8. Tell the children that the breathing holes in leaves are not really visible to our eyes, but the dots show where they are.

Page 9. These animal and plant pictures illustrate both Reproduction and Growth.

FOOD, *pages 10-15*

Page 11. You will probably have to help the children to write about the chameleon.

Point out that giraffes normally feed from tall trees, hence the long neck.

As an alternative let them try to draw their ideas. Similarly when they write up their Nature Diary much of it can be done by drawing and labelling.

Page 12. In the second lesson you help their written answers by providing this form: (Name of animal) are (good or bad) to eat. Leave the children to fill in the blanks. The lists could contain the English and vernacular names. The smaller animals on this page are Goat, Duiker and Oribi.

Page 13. Children will have to be helped with the words 'cutting', 'tearing' and 'grinding', in describing the work of different kinds of teeth. You can stimulate the children's interest in collecting skulls by bringing one or two yourself. This is important. Those shown are: 2. Crocodile, 3. Snake, 4. Dog, 5. Rat.

Two or three chickens should be borrowed for direct observation. It is important that the mouth parts of at least one animal are observed under your supervision, drawn and talked about during the period.

FIRE, COOKING AND KEEPING HEALTHY, *pages 16-20*

Page 16. The experiment with fire should be done outside. Any method of cutting off first part of the air, and then all of the air, may be used; covering with pieces of grassy turf, or a box will serve. A visit to a blacksmith's forge would demonstrate the effect of extra air making fire burn more fiercely.

Pages 18-19. Demonstrate how the 'seeds of sickness' get into drinking water, and how boiling destroys them. Show also how flies bring illness from housing areas to markets. Various Welfare and Health organisations may be able to supply you with posters. Children must clearly understand that latrines should *not* be put where water can flow from them towards wells or streams where people drink.

PLANTS GROW FROM SEEDS, *pages 20-25*

Page 20. You will need to start your own private experiments a week earlier than the children.

Page 22. Your best specimens of flowers and plants should be kept in a special 'book', and should be pressed several times in fresh newspapers before fixing in the 'book'. Dusting the 'book' with finely crushed moth-balls helps to preserve them from insects.

Page 24. The differences between the kinds of seedlings used are: 1. The number of 'food leaves' in the seed case. 2. The kind of first leaves. 3. The way the stem branches out as it grows.

Page 25. Make sure the cardboard is big enough to stop water poured on the leaves from getting into the bottom tin, and so getting into the plant by the roots. This would spoil your experiment.

ABOUT ANIMALS, *pages 26-31*

Page 29. You will probably have to make at least one of the glass-fronted cages yourself first, so that the children can copy it. Certainly you will have to cut the glass, or get it cut to shape for them when their boxes are ready.

Page 30. The pictures of animals are only for interest, but this lesson really requires you to see what you can get them to bring, animals and insects. Do not rely on these pictures alone. For instance, the pictures of the frog do not make it clear that there are five 'fingers' on the foot and details must be checked by the children's observation of whatever live specimens can be brought to school. The feet shown are those of duck, frog, heron, vulture, deer, horse, dog and cat.

MORE ABOUT PLANTS, *pages 32-35*

Page 32. It is essential that real examples are produced of everything on these pages. The pictures are only helps.

Page 34. It is important to choose the right time of the year for this topic, when the Red Pepper plant, for instance, will show all the stages shown in these pictures.

Page 35. The sentences are intended to follow the pictures 1-6.

E.g. Seeds come from the flower.
Petals fade away.
The lower part of the flower grows bigger.
This part dries up or becomes ripe.
It falls from the tree or bush.
The seeds inside come out.
They are scattered about.

These are suggested answers, and are not statements for the children to learn.

AIR AND WATER, *pages 36-41*

This is a good opportunity to have every child doing his own experiment. Each child can bring what is required.

Page 36. Answer: Wind is moving air. (See they put this into their own words.)

Page 38. The picture of the pond is only typical. You may not find all these things in a local pond or river. You may find many other things not shown here.

The children should bring water plants and animals to be kept in jam jars, but remember it takes a large quantity of plants to keep the water fresh enough for just two or three tadpoles or one little fish. If you are not strict about this, you will always fail to keep them alive.

The picture shows Tadpoles, Water Spider, Frog, Fish, Mussel, Water Beetle, Water Snail, Dragon Fly.

Pages 40-41. The experiments should be done in groups of four to six children each.

The water goes away into the air more quickly if it is in the sun, and fanned at the same time. It is slow to go into the air when it is in the shade and cool.

SKIN AND BONES, *pages 42-45*

Page 43. You may be able to provide more examples than these. The more you can produce the better.

Pages 44-45. For the lesson on the skeleton it is important that you show one or two specimens of your own. They look best when mounted on dark paper.

Those shown on this page are Frog, Chicken, Rabbit, Bat.

COMPETITION

The live things are 2, 3, 7, 9, 11, and 14. Coming from live things, though not now themselves alive are 6 and 8. Parts of 12 and 13 are made from things that were once alive. Those that have never been alive or part of anything alive are 1, 4, 5, 10. (We are not counting the ants inside the ant-hill as part of the hill.)

BOOK TWO

SMALL THINGS WITH JOINTED LEGS, *pages 2-9*

Page 2. These traps should be tried out by you some time beforehand in a variety of places. It is a matter of experiment to find out where the flies that you want are likely to be found.

Page 3. The exact measurements are not necessary for the case for the ants, but the case must be very narrow, not more than an inch. You will have to get the pieces of glass yourself, though the children should provide the wood.

Pages 4-5. You should already have made a small collection of butterflies, moths and other insects for yourself, and should know the plants on which they feed, and the likely places where the eggs and pupa are to be found.

Pages 6-7. You will find it difficult to get a complete collection of the Ant Lion, its egg and the 'Nymph' which comes from the egg all together. But it is worth while to make a special effort well before the lesson is due, as the pictures themselves are insufficient. Similarly, specimens of the Weaver Ant grubs, which they are using to weave their nests, are difficult to obtain and require a lot of patience. At this stage, however, this attitude of patient investigation is a valuable one to teach the children. It can only be done by example.

Page 8. It will be easier to find the different kinds of termites by digging into one of their hills.

AIR AND THE WEATHER, *pages 10-19*

Pages 10-11. The experiment with the candle will not work well unless there is a *small* bead next to the head of the pin (see last picture).

Pages 12-13. The hot air balloon experiment must only be

performed in the open air, clear of buildings. The paper must be very thin and light and large (2′ to 3′). Methylated spirits give the best result.

Page 15. You must have a cooler to provide the cold water for the bottle shown on this page. It is important that the children fully realise that the drops of water come from the air around and do not come out through the glass.

Pages 16-17. This is only a picture. The whole thing can be made much more real if you are within reasonable distance of a stretch of water and mountains, where the children can be taken outside to see a similar view.

Pages 18-19. The one scientific fact we have not been able to demonstrate to the children, is that the water in the air would not form into tiny droplets unless there are particles of dust in the air for the droplets to form round. Later in this Course it may be possible to demonstrate even this, but it is too difficult at this stage. This is one of the very few things that will have to be merely 'told'.

LOOKING AT ANIMALS, *pages 20-23*

Pages 20-23. Live specimens are absolutely essential for success. You may be able to get other animals than those shown on these few pages. The same series of questions will apply to them. We have chosen the most familiar ones.

Remember that drawings will be crude, but resist the temptation to give them a copy to draw from, and spend some time in helping them to improve their own efforts. Whenever they have made a mistake, get them to look again at the actual animal—not at a drawing of yours, or this book.

MOVING ABOUT, *pages 24-27*

Pages 24-25. It would add interest to the lesson if you could collect drawings of other footprints of animals for the class to recognise. (4) is a rough drawing of the footprints of horse and cow.

Pages 26-27. The models can be made from thick cardboard as well as wood. Three-ply wood is best if you can get it. Various kinds of rubber elastic can be used. You will make an example of each of these models for the groups of children to see, and to copy in materials they have brought.

MORE ABOUT WATER, *pages 28-33*

Page 28. When you try this yourself, you will find that much depends on how long you stir the various things in the water. Use warm water if you can, because it will dissolve things more quickly than cold water. Salt and soap will take a long time, especially if the water is cold. Remember that it takes very little soap or salt to alter the taste of the water, so do not use too much.

Different groups in the class may do different experiments at the same time. You can help them to compare their results.

Page 29. If you cannot get a small tin funnel, then make one of cardboard or thick paper, but see that where the edges join they are folded over once or twice before pinning them. One of the groups can be seeing that the water for the last experiment is very thoroughly boiled, while other groups are doing the experiment before this one.

Pages 30-31. The most important things to remember about these experiments are that the plants must be as nearly alike as possible, that you mark carefully where the oil comes to on the small bottles, and that the large bottle is sealed off from the air with vaseline or grease. (Motor car grease will do.) The plant without leaves is to show that without the leaves the plant is not able to get rid of the water brought up from the roots, and so it cannot take in water from the roots either.

Pages 32-33. These pages show plants which have to do without a lot of water, and also plants which live IN water. Get the children to collect other plants that grow where there is too little or too much water.

THE PLANT TAKES CARE OF ITS SEEDS, *pages 34-37*

Pages 34-37. It is absolutely essential that you should collect examples for these pages. The cut sections should be left on the Nature Table for one or two days, not longer.

The shortest answer to the question is that Seeds need to be carried away from the parents to prevent overcrowding, but there are many other ways the children can say this in their own words. It is for you to get them to do this.

LOOK AT THE LAND, *pages 38-43*

Page 38. Every child can do part of one of these experiments. Not more than four children are needed to do each complete experiment. For success make sure that you have good examples of the three types of soil.

Page 40. Do your best to find a road cutting like this. If you cannot, then get the children to dig a hole or trench to show the sections. If the rock is fairly near the surface, you should get a good section. If it is not near the surface, it is not worth while digging down more than about three feet.

Answers: Small plants like to get their roots into soil which has plenty of 'plant remains' in it.

The long roots go down for water.

When a root comes to a stone, it goes round it.

Page 41. You can see that the good soil has a lot of 'plant remains' because they burn and glow red.

The mixture changes colour, and the jar is warm.

The candles under number 1 experiment should be lighted. They are heating the soil.

Again, every child can take part in this work. It is worth while spending extra time, or two lessons instead of one, to allow the children to do this, because there are not many experiments where this is possible.

Pages 42-43 You can only have a small number of groups for

this, because you need 2, 4, or 6 trays to do this. Most of the children will have to watch. These trays are used for so many useful experiments, that it is advisable to have as many as six. They should be at least three feet long.

Answers: Water sinks more in the . . . than in the . . .
Water runs off the top of the . . . more than the . . .
More water escapes into the buckets from the . . . than the . . .

The same series of questions can be set out for 2, 3, 4, and 5, using the following headings: 'Good soil', 'Furrows going down the slope', 'Furrows going across the slope', 'Soil with grass', 'Soil without grass', 'Soil on a gentle slope' and 'Soil on a steep slope'.

TAKE CARE OF YOUR BODY, *pages 44-47*

Pages 44-45. These pictures should need little explanation from you, but they can be added to by the posters that the Red Cross and the Welfare and Mass Education services provide. Write for these several weeks before you need them.

Pages 46-47. Examples of animal backbones are difficult things to prepare, and you must think well ahead to have some of them ready for the children to see. You can make a simple model of a backbone by threading a number of cotton reels on to a thick piece of string.

BOOK THREE

This Third Book asks for many more written answers than Books I and II, and we have set out to help you in this.

WATER AND SOIL, *pages 2-11*

Pages 2-3. You must try to find a place where this kind of thing is happening now.

Ans. 1. The rocks are broken up by the (sun), the (rain) and by (plants).

Ans. 3. The fine soil is taken away in (the water). This does happen everywhere when it rains.

Ans. 4 and 5. The remaining pieces are (a mixture of rounded and sharp stones).

Ans. 7. The soft pieces have had their sharp edges ground away by the hard pieces. As the shaking up of the particles in tins takes rather a long time, several children might take turns at shaking each tin.

Ans. 8. The fine sand or chalk has come from (the soft pieces).

The account should be a simple description in the first person, 'I did this, and this,' etc.

Pages 4-5. If there is difficulty in answering the first question, you should refer back to Book I, page 40. Come to the lesson prepared to do that experiment again.

Ans. 1. The water in the river flows always the same way, because it is finding its way down to a lower level.

Ans. 2. It goes into the sea or into (a lake or a river larger than itself). In very dry places it sometimes loses itself in the sand.

Ans. 3. The river is widest at (the end).

Ans. 4. The mountain river is smaller, it goes faster, the banks are steeper and the water is not smooth because of the boulders and rocks.

Ans. 5. should be put in this form: 'Rivers are important to us because . . .'

If there is no other way of showing streams or rivers to the children let them fill a number of buckets with water. Choose a suitable part of the school ground, where there are channels caused by previous rain, and pour the water slowly out of the buckets. Let them see how one stream joins up with another to form a larger one.

Pages 6-7. Make one of these river valleys in a tray in front of the children, to show them how to do it, and then the groups could make their own 'Valleys'.

Ans. The answers to the last set of questions on this page are very important:

When water moves slowly it can carry (fine soil) away.

When water moves fast it can take (stones and heavy soil) away.

When fast moving water, carrying soil, meets something that makes it go more slowly, then some of the soil (is dropped).

Remember that the children's own answers to this may be in different words. DO NOT TRY TO MAKE THEM LEARN YOUR ANSWERS.

Pages 8-9. Even if you have to make two or three of these simple weighing machines yourself, they are absolutely essential to the carrying out of many experiments that follow.

The simple ones using only a block of wood can, however, be made by groups of children together. You will have to check the accuracy of the marks they put for the various weights, or you can get them to check each other's.

Pages 10-11. Look very carefully round the area near the school, and try to find examples of this kind of thing happening. Any outdoor example is far better than the pictures. Look at land that has been left wild for a few years, and see how the vegetation is coming

back. Do not be too proud to learn all you can about this from local farmers. Ask a farmer to talk to the children about it for you.

This particular lesson gives a good opportunity for the children to answer the questions without your help. Your examples from the area around, and the facts given by the farmers, and these pictures should all help them to answer in simple sentences.

You will have a lot of correcting to do as a result of this. Children must be prepared for the time when they will always write their answers in English unaided.

FLOATING AND SINKING, *pages 12-15*

Pages 12-13. You need really fine clay to do this. Plasticine is better, but many schools do not have it.

Answers to B may be verbal.

Ans. C is a very difficult one. Encourage them to think hard and try to answer, but if most of them fail, it is better to leave it unanswered until the end of the next lesson than to 'tell' them the answer now.

Next week's lesson needs a special effort to get them to bring enough apparatus for every child to take part. Start collecting early.

Pages 14-15. Success in this lesson depends almost entirely on how carefully you have carried it out yourself before the day of the lesson.

The answers at the end are very important indeed.

Ans. The weight of clay, and the weight of the water pushed out of the way when it floated, are the same.

The fact that you want to make clear is that 'You can make many things float that would otherwise sink, if you alter their shape, so as to push out of their way their own weight of water'.

You may help them to put this fact into their own words, as long as you are quite satisfied that they mean the same thing.

This introduction to true scientific experiment is so important,

that you should be prepared to repeat it if you are not satisfied that the children understand. Do not be hurried about it, even if it takes three lessons.

THE LIVING PARTS OF PLANTS, *pages 16-23*

Pages 16-17. The first lesson consists of preparation for the experiment and nothing else. The children are not required to write or draw until the following week.

This next lesson is wholly occupied in recording the results of the experiment. You should be most careful that their observations are accurate.

Resist the temptation to 'tell' them what they should see. Get the account from the children in their own words.

Ans. A3. Plants bend their leaves and stems towards the light.

B3. The roots always try to grow in the direction of water, even if it means going up instead of down.

Pages 18-19. Do try hard to obtain one or more magnifying glasses—half a dozen if you can.

Ans. A. Water enters the plants through the roots.
Air enters the plants through the holes in the leaves.
Sunshine enters the plants through the leaves.

Ans. C. The food stored could be starch because, when put on the yam, iodine behaves in the same way as it does when put into starch.
In some plants the food stored is sugar.

Pages 20-21. You will have to give yourself a lot of time to carry out these experiments for yourself beforehand. Do not be content until they work perfectly. Only then can you organise the children in groups to do them.

Ans. B. The insects are dead.

They have used up part of the air. (You may find that the children say that they have used up the air—in fact they have only used the Oxygen part of the air, but accept their answer for the time being.)

We are using the words 'used up air' for air without Oxygen in it. We are using 'the burning part of the air' for Oxygen. Carbon Dioxide is left as 'what animals breathe out'.

Ans. C. Air in the empty jar was not used up, and so you could burn a lighted splinter in it.

Ans. D. After verbal revision of what they have done, the children should not find it difficult to write it down in simple sentences. One sentence for each stage shown in the pictures should be enough.

The questions at the end are easily turned round into answering sentences. For instance: 'I think that burning and breathing do the same thing to the air.' Help them to do this first one, and then leave them to do the others unaided.

Pages 22-23. It will help both you and the children to understand what you are required to do, if you look back at the page before, and see that three of the four experiments are to be done again, in order to provide three kinds of used up air A1, B1 and D1. The children must be organised in groups so that the three kinds of experiments go on at the same time. Remember that the group dealing with the live things will have to start early; how early this is you will have found out when you did it yourself.

At the end of the lesson ask children from each group to say verbally what they have been doing. Then let them write their own accounts of their work.

Ans. 6, 7 and 8. Discuss these questions with the class without telling them the answers. Do impress upon them that they have found out two facts upon which all life on this earth depends.

LIVING PARTS OF ANIMALS, *pages 24-31*

Pages 24-25. Ideally you should have one fish to each group, but you will probably have to make do with a fish that you have caught yourself. Allow the children to file past and to see what you show them as they do so. This will take a long time, and is not the kind of

thing you should often do. It will be worth while if you prepare them for what they are to look for BEFORE they come out.

On the other hand, the children can each bring a grasshopper to look at for themselves. A match-box is a useful thing to keep them in temporarily. Grasshoppers are best observed under a jam jar turned upside down, so they will need these too.

Pages 26-27. The children will need some help in drawing this set of pictures showing two meals passing through the body.

Pages 28-29. If you can obtain more than one bicycle pump, two or three groups can do this experiment.

Pages 30-31. You may find it advisable to spend the whole of one lesson discussing the work of the blood as it goes round the body.

FLOWERS, *pages 32-37*

Pages 32-33. When you try this out yourself, you may not be able to find all the flowers that are mentioned. What is important is that you allow yourself extra time, two weeks before the lesson, to go out and look for other flowers that will do just as well. The collection that you make for yourself should contain many different arrangements of flowers on stems and branches, and flowers with different arrangements of their petals and other parts. You could, of course, take some of the children with you on this preparatory expedition out of school hours; this would add interest both for you and for them.

You can then show them, the week before the lesson, the kinds of flowers they are to bring, and you will be able to tell them where they are to be found.

For the pressing of flowers see Book I, page 22.

Pages 34-35. Pay attention to the accuracy of the drawings the children make of the parts of the flowers which they pull to pieces.

If you have already sorted out your collection into 'family arrangements', then you should find it easy to help the children to do the same.

These 'family arrangements' need not be the ones you find in

books. The idea we want to teach is that some are related more closely than others, and for this purpose the Botanical classification and names do not matter.

Although in preparation for these lessons you will not only have collected the flowers, but also done the drawings asked for in the text for yourself, do resist the temptation to show them to the children. Be sure their drawings are entirely their own, from what they see on the desk in front of them.

WEATHER, *pages 38-47*

Pages 38-39. The idea of (A) is to show that air has weight. This should be clear from the fact that the air which is pressed together in the balloon weighs more than the other air.

Ans. A. Air pressed together weighs more than air that is not pressed together.

Cold air is heavier than hot air. (Remind them of all the things which show that hot air rises.)

Ans. B. To squeeze something very hard, you should put it between books at the bottom of the pile.

Ans. C. The air presses most on the aeroplane on the ground. The air presses least on the aeroplane which is high up in the air.

Ans. D. Water presses most strongly at the bottom of the tin. I know this because the water shoots out furthest from the bottom hole.

Pages 40-41. The experiment with the gallon oil can is a most dramatic one. The can used must be one with a screw cap. No more than one inch of water should be put in it. The water must boil well and then the can must be held with a cloth and the cap screwed on immediately so that it is completely airtight.

Ans. B may be difficult for the children. The sides of the tin are crushed in because there is nothing on the inside, and there is all the air in the world pushing upon the outside.

Pages 42-43. It is important that you organise the children to keep

records of the readings of these instruments and those they are going to make in the next few lessons. They can keep individual records in their Nature Diary, but there should be a Weather Chart on the classroom wall, where the results can be entered each day.

Pages 44-45. Cloth and rope shrink when they are wet. If you stretch a rope between two trees or posts, and hang a small weight on it, just to keep a slight strain on the rope, then when the rope is dry, the weight will come lower, and when it is wet the rope will tighten and pull it up.

Pages 46-47. By now you should have a small collection of instruments made in the classroom, which will provide the class with its own very small Weather Station; and it remains now to operate this for the rest of the year. This is why in the Teachers' Notes at the back of Book III you are told to deal with this group of topics before the last term.


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